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ABSTRACT

This document contains four papers concerning collegiate aviation research and education solutions to critical safety issues. "Panel Proposal Titled Collegiate Aviation Research and Education Solutions to Critical Safety Issues for the Tim Forte Collegiate Aviation Safety Symposium" (Brent Bowen) presents proposals for panels on the following topics: geographic north versus magnetic north to provide enhanced national airspace system safety; weather safety training for general aviation pilots through computer flight simulation; identification of human behavior and aircraft maintenance safety issues; disaster preparedness, emergency response, and curriculum development; the collegiate aviation emergency response checklist; and systemic initiatives in aviation safety research. "Current Regulatory Status in Regard to Maintenance Resource Management" (Chien-tsung Lu, Brent Bowen) explores documents, evidence, and perspectives on maintenance resource management training. "Disaster Preparedness, Emergency Response, and Curriculum Development" (Michaela M. Schaaf, Brent D. Bowen) discusses a new upper-level aviation course at the University of Nebraska at Omaha that grew out of research in the area of

safety, disaster preparedness, and emergency response. "The Collegiate Aviation Emergency Response Checklist: Fundamental Pre-crisis Planning" (Mary M. Fink, Michael K. Larson) discusses and presents the University of Nebraska at Omaha Aviation Institute's emergency response checklist, which is designed for use if a flight student is involved in an aircraft accident or incident.
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THE UNO AVIATION MONOGRAPH SERIES

UNOAI Report 01-5

Collegiate Aviation Research and Education Solutions to Critical Safety Issues

Brent Bowen
Editor

2001

UNO
Aviation Institute
University of Nebraska at Omaha

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Brent Bowen
Editor

April 2001

UNO
Aviation Institute
University of Nebraska at Omaha
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The University of Nebraska at Omaha

Aviation Institute

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Panel Proposal

Titled

Collegiate Aviation Research and Education Solutions to Critical Safety Issues

for the

Tim Forte Collegiate Aviation Safety Symposium

Conference Focus: Best Practices and Benchmarking in Collegiate and Industry Programs

April 19-20, 2001

Denver, CO

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I. GEOGRAPHIC NORTH VERSUS MAGNETIC NORTH TO PROVIDE ENHANCED NATIONAL AIRSPACE SYSTEM SAFETY - Michael K. Larson, University of Nebraska at Omaha

One of the most dramatic changes in aviation navigation is taking place as the ground-based VOR is being replaced by the satellite-based GPS as the primary navigational facility in the National Airspace System (NAS). The most recent Federal Radionavigation Plan (FRP) proposes that by 2013 only a skeletal system of VOR/DMEs will serve in a supportive role to the GPS based enroute navigation system. The capabilities of GPS present many potential enhancements to the efficacy and safety of the NAS. But, like many other high technology aircraft and flight systems, GPS can add complexity and, thus, workload for pilots. A concerted effort must be made to find means to simplify pilot operations in order to avoid work-overload conditions leading to loss of situational awareness.

One such proposal takes advantage of the simpler navigation operation procedures provided by a Geographic North based model versus the current Magnetic North based model. GPS receivers automatically provide position with respect to longitude and latitude and motion with respect to Geographic (True) North along a Great Circle track. Thus, with the GPS and a Geographic North based paradigm, procedures of converting true courses to magnetic headings by applying wind correction angles, magnetic variations, and magnetic deviations are no longer required. Additionally, magnetic disturbances and dip errors become irrelevant; and wind correction angle compensation becomes unnecessary for intercepting/tracking procedures and ATC vector.

II. WEATHER SAFETY TRAINING FOR GENERAL AVIATION PILOTS THROUGH THE USE OF COMPUTER FLIGHT SIMULATION - David Widuaf, Utah State University

Flight into Instrument meteorological conditions is the leading cause of General Aviation fatal accidents. This has been a persistent trend over many years. This proposal offers a possible solution to reduce these fatal accidents. Indicated in the proposal is the use of Computer-Based Training (CBT) through existing Personal Computer Aviation Training Devices (PC-ATD). These PC simulators would be used to develop hands-on training scenarios for beginning pilots and recurrent training for experienced pilots. Pilots would be placed in simulated weather conditions they would not normally see and evaluate and improve their reactions to these scenarios. The conceptual design of this study is presented for expert participation in the conceptualization of research phase.

III. IDENTIFICATION OF HUMAN BEHAVIOR AND AIRCRAFT MAINTENANCE SAFETY ISSUES - Chien-tsung Lu, University of Nebraska at Omaha

During the past few decades, the Federal Aviation Administration, the National Transportation Safety Board, the National Aeronautics and Space Administration, aircraft manufacturers, and other safety advocate groups have conducted numerous research projects on the topic of human behavior. The majority of the research conducted was related to flight crew behavior. The main purpose of this project is to focus on human behavior issues related to maintenance technicians. The selected methodology, a survey, will be administered to

maintenance personnel and the results analyzed to identify needs for future human factors training.

IV. DISASTER PREPAREDNESS, EMERGENCY RESPONSE AND CURRICULUM DEVELOPMENT - Michaela Schaaf and Brent Bowen, University of Nebraska at Omaha

Curriculum development can be achieved through the application of the research model. A new upper-level aviation course at the University of Nebraska at Omaha followed such a plan. The course, Airport Safety and Security, was conceived following the crash of TWA 800 and the subsequent White House Commission and the growing awareness of emergency planning and disaster response in aviation. The course was developed utilizing research into the curriculum needs in this area, including discussions with industry and government experts. The results of this research revealed components for inclusion, such as airport and ramp safety, OSHA requirements, risk assessment and management, disaster preparedness, emergency response plans, coordination among authorities, crisis communication, and passenger rights. The research also revealed that the structure of such a course lends itself to a seminar format and required many areas of expertise.

V. THE COLLEGIATE AVIATION EMERGENCY RESPONSE CHECKLIST: FUNDAMENTAL PRE-CRISIS PLANNING - Mary Fink and Michael Larson, University of Nebraska at Omaha

The University of Nebraska at Omaha Aviation Institute's commitment to the provision of a safe learning environment both in the classroom and in the air has led to the creation and adoption of an Emergency Response Checklist to be utilized in the event that a flight student is involved in an aircraft accident or incident. The plan came to fruition as the result of best practices research which examined crisis management plans at several regional flight training providers. Four Midwestern universities with aviation programs and one Air Force flying club were polled regarding current crisis procedures. At the time of the initial study, only one of the flight training providers possessed a crisis response plan. This plan outlines the roles of the flight vendor, as well as those of University of Nebraska at Omaha Campus Security, Student Affairs, University Relations, and the Aviation Institute. The goal of this plan is to eliminate uncertainty and assure that emergencies are responded to in an efficient manner with a clear and open flow of communication among all designated channels. As a result of this study, the Aviation Institute has implemented its own Emergency Response Checklist with all applicable university channels and contracted flight vendors. The outline of the checklist will be provided for review, comment and potential adoption by collegiate aviation flight training programs.

VI. SYSTEMIC INITIATIVES IN AVIATION SAFETY RESEARCH - Brent D. Bowen, University of Nebraska at Omaha

The scope of need in aviation safety research is daunting. Whenever we learn of tragedy we consider if, through enhanced knowledge, we could prevent another loss. At the University of Nebraska at Omaha Aviation Institute, a key tenet in our mission "advocates the development of improved aviation/aerospace systems while furthering their integration into the overall modal transportation architecture." Toward this charge, the enhancement of systemic safety in aviation

is a priority in the research directions undertaken. A review of the several ongoing aviation safety research projects at the Aviation Institute are presented and discussed in the interest of identifying collaboration opportunities. Integration of collegiate aviation resources in the area of safety education and research development will result in safety enhancements for the overall air transportation system.

Author Biographies

Dr. Brent Bowen is the University of Nebraska Foundation Distinguished Professor in Aviation. He serves as Director for the Aviation Institute and as Director of Aviation and Transportation Policy and Research at the University of Nebraska at Omaha. Additionally, Dr. Bowen is the program director and principal investigator for the National Aeronautics and Space Administration funded by the Nebraska Space Grant Consortium and NASA EPSCoR Program. He is an Airline Transport-rated Pilot and a Aviation Safety Counselor for the Federal Aviation Administration. Dr. Bowen's research interests focus on aviation applications of public productivity enhancement and marketing in the areas of service quality evaluation and forecasting.

Mary Fink is the Coordinator of Research and Special Programs for the Aviation Institute. She holds a Bachelor's degree in Aviation Administration from the University of Nebraska at Omaha. Ms. Fink will complete her Master of Public Administration degree with a concentration in Aviation in May 2001, at UNO. In addition to administering NASA-funded research programs in excess of \$5 million, Ms. Fink is actively involved in the Aviation Institute's distance education program. She instructs Special Topics in General Aviation and Independent Research in Aviation for the Aviation Institute. She is a Federal Aviation Administration licensed private pilot and is a member of the American Society for Public Administration; Women in Aviation, International; the Omaha-area 99s; Alpha Eta Rho, International Aviation Fraternity; the University Aviation Association; and Omicron Delta Kappa Leadership Society. Her research interests lie in the areas of transportation policy and intermodal systems.

Dr. Michael K. Larson is a professional aerospace educator and pilot with over 30 years experience and 14,000 hours of pilot time, including service with Pan American World Airways. He holds a Master of Science Degree and Doctorate in Aerospace Education from Oklahoma State University. Dr. Larson was an FAA Aviation Safety Counselor and Designated Examiner with privileges in both Alaska and Oklahoma. FAA Licenses and Ratings include Airline Transport Pilot Airplane Single and Multi-engine Land and Airplane Single Engine Sea Certified Flight Instructor (Gold Seal/ASEL/ASES/AMEL/Instrument) Flight Engineer (Turbojet Powered) FAA Safety Counselor. His research interests include GPS systems within the National Airspace System framework, safety research on in-flight severe weather encounters, and policy research to update federal air regulations for modern pc-based simulation in pilot training and technological innovation in the National Airspace System.

Chien-tsung Lu is a doctoral research assistant at the University of Nebraska at Omaha. He attained his MS degree in Aviation Safety from Central Missouri State University. He is an FAA certified aviation technician and Federal Communication Commission (FCC) licensee. He is currently pursuing his Doctorate of Public Administration degree with an area of specialization

in Aviation Administration. Mr. Lu's research interests are in the areas of airline maintenance safety management, accident investigation and prevention, human behavior and safety, aircraft cabin safety and training, and public policy.

Mrs. Michaela Schaaf is Instructor of Aviation and Senior Research Associate at the UNO Aviation Institute. She holds a Master of Science degree, Aviation Concentration, from the University of Nebraska at Omaha where she is presently working toward a Doctorate in Public Administration with an Area of Specialization in Aviation Administration. Mrs. Schaaf is also pursuing a Certificate in Aviation Safety and Security Management from The George Washington University. Her Federal Aviation Administration certificates include Private Pilot and Basic Ground Instructor. Additionally, Mrs. Schaaf serves as Assistant Director of the NASA Nebraska Space Grant Program. She is a member of Women in Aviation, International; Council on Aviation Accreditation; University Aviation Association; American Society for Public Administration; Omicron Delta Kappa, Alpha Eta Rho; and Civil Air Patrol. Her research interests are in the areas of aviation security, curriculum development, program evaluation, and women in aviation.

Dr. David P. Widauf is the Aviation Program Coordinator and Associate Professor of Industrial Technology in the College of Engineering at Utah State University. He received his Doctorate in Industrial Technology from Texas A&M University, his M.A. in Educational Administration from Pepperdine University, and his B.S. in Aeronautical Engineering/ Industrial Technology from California Polytechnic State University. He is a former Technical Engineering Program Manager and Project Engineer for E-Systems Inc. and Squadron Navigator for the U.S. Air Force. As a Colonel in the Air Force Reserve, Dr. Widauf serves at Hill AFB. He currently is teaching classes in Aviation Science, Aerodynamics, Composite Materials, and Aircraft Systems. His research has included developing, manufacturing and successfully testing a composite nose cone for the "Bow Shock" project for the Utah State Space Dynamics Laboratory. He is a co-principal investigator on a remote sensing research aircraft platform for the Rocky Mountain Space Grant Consortium.

Planned format: Panel Paper Presentations

Audience: Educators, Researchers, Students, Practitioners

Anticipated length: 120 minutes

Current Regulatory Status In Regard To Maintenance Resource Management

By

Chien-tsung Lu
&
Brent Bowen

Aviation Institution
University of Nebraska at Omaha

Abstract

The Federal Aviation Administration's (FAA) current Federal Aviation Regulations (FARs) do not explicitly require Maintenance Resource Management (MRM) training. Whilst the benefits of MRM training, which originated in human factors researches, have been recognized by the air industry and its mandatory implementation has been regulated by many aviation authorities such as those of Canada, United Kingdom, and European Union (EU) countries, the FAA in the United States retains its non-regulation stance. This situation has raised both curiosity and a research anxiety to discover the rationale underpinning such decision making. This white paper aims to explore related documents, up-to-date evidence and real-world perspectives in relation to MRM training. Consequently, the authors hope to generate research propositions and tentative theories for future policy study.

Introduction

Overview

Aviation safety issues are always at the forefront of public concerns. The American flying public has appreciated the development of technology in favor of modernizing civil air transportation since the passage of Airline Deregulation Act in 1978. After deregulation, the government's legislative attempt in enhancing aviation safety and revitalizing civil aviation - the public experienced more efficient, comfortable, and competent air transportation. However, people have also been continuously demanding a safer, accident-free aviation environment. Therefore promoting aviation safety has become one of the top priorities for the government and air carriers. Unfortunately, the potential for aviation accidents still threatens us.

Historically, pilot error has contributed the majority of aviation accidents (Boeing, 2000). The National Aeronautics and Space Administration (NASA) has conducted human factors research that aims to cure flight deficiency-pilot errors (Orlady & Orlady, 1999). Since the early 1970s, NASA human factors researchers have developed the Crew Resource Management (CRM) training as response to this. Since then, CRM has been an important safety training for pilot, which aims to taper pilot error. As a matter of fact, since United Airlines (UA) initially launched its voluntary implementation of Crew Resource Management (CRM) in 1981, pilot error-related accidents have been reduced (Mudge, 1998; Lu, 2001). NASA's successful human factors experiments and knowledge implementations in airlines have later lead to another important system of training - in this case, for AMTs - called maintenance resource management (MRM), which came about in late 1980s.

After UA's successful application of CRM, the Federal Aviation Administration (FAA), in 1990, mandated Crew Resource Management (CRM) for all airline pilot (Aviation Supplies & Academics [ASA], 2001a) in addition to the existing regulations regulating pilot qualifications, operations, and activities (i.e., medical standards, flight rules, standardized operations, and training). The mandatory implementation of CRM by regulation aimed to ensure the reduction of pilot errors for the entire air industry (United States Government Printing Office [US GPO], 1990). Meanwhile, MRM training also attempted to prevent maintenance errors since its birth and the results have been positively confirmed by the air industry and FAA itself (Lavitt, 1995). Interestingly, the FAA has not attempted to regulate MRM for maintenance personnel, while the public, academia, and the FAA itself have considered the MRM training as the vital role in promoting maintenance safety.

A review of FAA FARs reveals the fact that there is no regulation mandating any safety trainings for AMTs. This situation does not mean that safety trainings for the AMTs are not necessary. In fact, it generates policy controversy that needs to be discovered for academia researchers.

The FAA has contributed a new Advisory Circular (AC) 121-50D as a guideline of safety training for both pilots and AMTs. Yet, AC 121-50D mainly illustrates the guidelines for pilot CRM and partially mentions the concepts of MRM training (FAA, 2001). Even though the FAA has been circulating the AC 120-51D to the air industry, the nature of AC is not mandatory. AC is a document that is in an advice or encouraging fashion. However, without a legitimacy platform championing MRM training, the airlines' training regularity and willingness are both skeptical (Brackbill, 1994).

This white paper aims to explore the reasons behind the missing part of the FAA FARs in terms of the MRM training for AMTs. Why is it rational without regulating MRM? Is there any alternative to promote MRM instead of proposing regulations?

Background

After the passage of the Airline Deregulation Act of 1978, the nature of laissez-faire and free competition has forced airlines to further promote, or at least maintain air safety in order to compete with business rivals and survive (Chang, 1986). As Chang (1986) particularly stated in relation to safety training about Pacific market, the financial condition was primarily considered by airlines. For small airlines, the safety training could not be ensured without a strong financial support (Rose, 1992).

Meanwhile, airlines have tried to provide low-airfare products in order to attract more passengers and, ultimately, to survive in the Darwinian post-deregulation battlefield. Yet, providing both high safety level and low-fare air transportation seems paradoxical. Aviation safety researchers have already pinpointed the negative impact from deregulation and market competition on overall aviation safety (Kucinski, 1990; De Jager, 1993). Both Kucinski and De Jager stated that the passage of airline deregulation act not only shaped the current business ecology of air transportation in the United States, but also led to the substantial reduction of training cost (Brackbill, 1994). In particular, the cost of safety training and surveillance was typically dwindled if the airlines encountered a constrained operational budget (Kucinski, 1990; De Jager, 1993). They further argued the logic of this cost reduction phenomenon by revealing that the airlines tend to meet the basic safety requirements regulated by the FAA. In addition to this, it was found that by reducing operational cost, the airlines could possibly provide lower airfare for passengers, increase load factor, gain more revenue, and therefore survive. The Consumer Reports Travel Letter in 1997 outlined that it is highly suspicious that low-cost airlines can operate to a uniformly safety standard in the U.S. (1997 March).

The FAA's Dual Mandates – an Ambiguous Scheme

The public's concern with aviation safety has forced the government to pass related public laws and constantly inspect airline safety performance. The FAA has been in charge of air transportation affairs since its birth in 1967 (Rollo, 2000). On the one hand, the FAA should foster and encourage civil air commerce. On the other, the FAA also has to audit and promote aviation safety performance (Adamski & Doyle, 1995; Rollo, 2000). Yet, this "dual-mandate" responsibility has resulted in the FAA's insufficient ability in

safety surveillance (Nader & Smith, 1994). Consequently, the FAA's lack of effectiveness in safety inspection has been continuously criticized by the public (Connelly, 2001) as well as by the government itself (Stout, 1999, Dec. 2; Carmody, 2001; Filler, 2001 July 11).

The Traditional Pilot-oriented Aviation Safety Focus

According to an annual report from Boeing, "Worldwide Commercial Jet Airplane Accidents," in 2000, cockpit crew error was the primary factor causing accidents (Boeing, 2000). Between 1991 and 2000, pilot error had contributed to around 66% of the accidents in the entire commercial aviation business. In the same report, the Boeing Company indicated that it was worse between 1959 and 2000 (68.3%), which meant pilot error remained high when compared with the other causalities. Yet, we must notice that more than 5% of commercial aviation accidents resulted from maintenance-related problems (Boeing, 2000). Concerning the goal of government's zero-accident proposal, 5% is too big to be ignored. MRM training is not yet regulated by the FAA. There are more than 5% overall aviation accidents caused by the mistakes of ground maintenance personnel (Boeing, 2000). For a persuasive evidence, the following headlined maintenance-error related mishaps (See Table 2) can be seen as an urgent warning signal to the air industry and government that indicates maintenance safety should be treated as significant before similar accidents happen again.

Table 2
Maintenance Error Related Mishaps

Date	Airlines / model	Maintenance Error	Cause	Fatality
5/25/79	American Airlines / DC-10	Yes	Engine separation due to flawed maintenance	272
8/12/85	Japan Airlines / B-747	Yes	Improper bulkhead maintenance	524
04/28/88	Aloha Airlines/B-737	Yes	Inadequate maintenance of aged fuselage	1
7/19/89	United Airlines / DC-10	Yes	Improper NDT maintenance of #2 engine turbine blades	111
01/31/00	Alaska / MD-82	Yes	Improper maintenance of jackscrew	88
11/12/01	American Airlines / A-300	Under investigation	In-flight break-up (parts of rudder and engines)	265

Resources: Data retrieved from the National Transportation Safety Board (NTSB) Accident and Incident database on-line [Retrieved on Sep. 22, 2001] and Dr. Shari Stamford Krause (1996), "Aircraft safety – accident investigations, analyses, & applications."

Purposes of Study

The main goal of this project is twofold. First, locate the significant views of the internal and external dynamic variables of human factors influencing aircraft maintenance and flight performance. Second, conduct an in-depth analysis and comparison in relation to MRM education and seek to yield a detailed understanding of current training scenarios and regulations across important aviation countries.

Significance

Despite the development of human factors and MRM education in aircraft maintenance field in the 1990s, ironically, many current working AMTs are not well educated in MRM, which could ultimately jeopardize aviation safety. Academia cannot overemphasize the importance of aviation safety research and should continuously explore the ways to strengthen it. Because there is no regulation of MRM, this white paper will primarily seek to discover the rationale behind this decision, fulfill the knowledge deficit for the purpose of promoting aviation maintenance and airline safety, and overarch the regulatory gap if possible.

Review of Literatures

After the fatal accident of Alaska Airlines Flight 261 in January 2000, caused by a flawed jackscrew maintenance and rushed inspection (Fiorino, 2001), many aviation experts have been boldly informed that the zero-accident cannot be achieved by focusing on flight safety only. The maintenance safety also plays a significant role in supporting aviation safety. The tasks of preventing flawed aircraft maintenance could not be overemphasized as well.

Identifying the Human Factors Affecting Maintenance Performance

Commercial airplanes are recognized as some of the most inspected and maintained transportation equipment in the world. The main purpose of aircraft maintenance is to keep aircraft remaining airworthy (King, 1986). The major components of an airplane, such as flaps, ailerons, rudder, engines, landing gears, and fuselage are inspected closely by aircraft technicians following standardized operation procedures (SOPs). Normally, airlines or fixed base operators (FBOs) produce their own standardized maintenance manuals approved by the FAA based on the original maintenance manuals provided by the manufacturers (Richardson, Rodwell, & Baty, 1995). Whether an aircraft is airworthy or should be retained for further detailed inspections is recommended by qualified maintenance personnel - the FAA certified AMTs (Delp, Watkins, & Kroes, 1994).

Typically, airline maintenance tasks are initially categorized into four routine checks, from A-check to D-check, as well as timed on an hourly to annual basis (King, 1986). Often, aircraft mechanics must remove access panels to closely and accurately inspect critical components, such as the electrical wiring, hydraulic system, cables, and look for severe corrosion in remote areas. In particular, when conducting a D-check

inspection - a detailed inspection and replacement of thousands of critical parts (such as engine bearings, engine blades, and o-rings) - must be accomplished in order to restore the compatible strength and usability of an aircraft (Butterworth-Hayes, 1997). Most importantly from the airline management perspective, each stage of aircraft maintenance should be efficiently and effectively completed for the shortest "on-the-ground" time and the highest amount of possible revenue-generating services.

Aircraft maintenance is quite challenging and intense. Therefore, human factors affecting job performance should be scrutinized. A survey conducted by Boeing Company and other safety researchers revealed the elements mainly contributing to AMT mistakes as the following: 1) boredom; 2) failure to understand instructions well; 3) rushing; 4) pressure from management; 5) fatigue; 6) distractions at critical time; 7) shift work; 8) poor communication; 9) use of incorrect parts and tools; and 10) unauthorized maintenance proceedings (Al-Almoudi, 1998; Taylor & Christensen, 1998). Wood (1997) and Drury (1999 & 2001) further argued the major problems of AMTs when conducting aircraft maintenance/inspection (See Table 3), and asserted that AMTs make mistakes and they are not error-free per se.

Table 3
Typical Aircraft Maintenance Inspection Problems

1. Fatigue and error - Awkward postures due to restricted spaces and unsuitable support stands leading to postural fatigue and errors.
2. Physical Impediment - Heavy and awkward lifting and movement of components, particularly around structural obstructions. This leads to component and structural damage, as well as to soft tissue injuries.
3. Biomechanics - Controls on access equipment, such as cherry pickers, which do not follow good human factors practice. Such poor control design often results in contact between the equipment and the aircraft structure.
4. Foreign Object Damage - Lack of tool counting and check-off procedures allowing for the potential of leaving tools inside structures when work is complete.
5. Ignorance - Lack of conspicuous visual indicators of correct closure leading to failure to close access hatches completely after maintenance.
6. Misconduction - Adopting incorrect instructions/tools or insufficient instructions/tools that leads to unairworthy condition and consequently costs more to restore.
7. Overlook - Failure to target critical/remote parts, equipments, or corrosion that requires replacement and repair.

Resources: Richard Wood (1997), *Aviation safety programs*, Coline G. Drury (2001, October 2), "*Establishing a Human Factors/Ergonomics program*" and *Human factors in aviation maintenance* (1999).

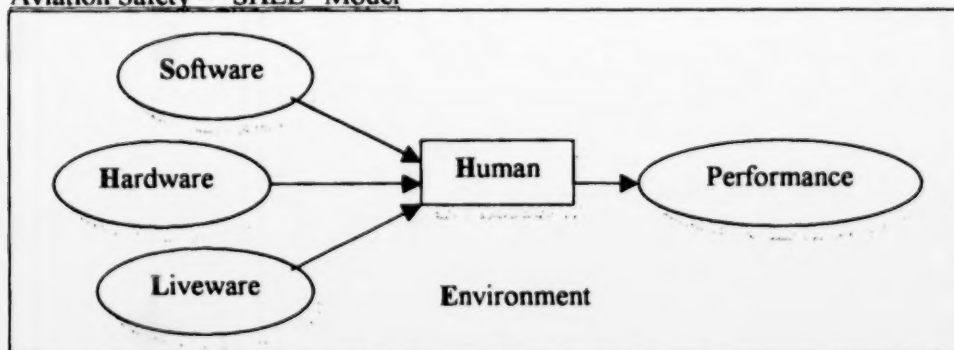
Without a doubt, because of its task complexity, physical and mental requirements (i.e., personal awareness, stress, situation habituation, rest, fatigue, and health), and tense working climate (i.e., shift work, managerial pressure, working efficiency, interpersonal communication, and external sociological influences), the maintenance issues contrasted with so-called human factors aspects are highly identical to those that affect flight performance. In particular, we should pay more attention to social and psychological

problems, because, although they cannot be easily sensed or visualized, they are influencing AMTs' decision making on a daily basis (Courchaine & Loucka, 1995; Hoffman, Granhag, Kwong, Sheree, & Loftus, 2001 April). The AMTs' working situation should be examined closely when considering the relationship between their health and job performance. In addition, the FAA does not require an AMT to hold an official medical certificate as like pilots. Apart from the routine medical test for alcohol and drug abuse regulated by the FAR Part 65.12 and 65.23 (ASA, 2001b), there is no required federal medical certificate for AMTs.

The Advantage of Maintenance Resource Management (MRM)

Maintenance Resource Management (MRM) training has been considered to be one of the cures for maintenance errors (Lavitt, 1995; Mudge, 1998). MRM was initially developed based on the experimental findings of human factors knowledge observed by NASA in the early 1970s. Human factors is a study concerning the interaction between human and software (S), hardware (H), environment (E), and liveware (L), which is so-called the "SHEL" model in aviation safety (see Table 4) (Krause, 1996). The interfaces between active elements (S.H.E.L.) and human beings constitute the framework of interactions and working performance.

Table 4
Aviation Safety – "SHEL" Model



Resources: Krause, S. S. (1996): *"Aircraft safety – accident investigations, analyses, & applications"* and Federal Aviation Administration. (2000, December 30): *"System safety handbook: practices and guidelines for conducting system safety engineering and management"*.

Likewise, human factors is an analytical science of the factors influencing human performance and consequently seeks to eliminate or dilute the negative impact from an explicit safety factor (Orlady & Orlady, 1999). Furthermore, human factors is scientific research regarding human-centered activities. Normally, it is the science of exploring human-centered activities that includes the research of human's inner and outer capabilities and limitations, and the adaptation to the change of environment (Koonce, 1999; Orlady & Orlady, 1999). Because the human factors concepts are underpinning the MRM training, the primary purpose of launching MRM training for the AMTs is to

restore an AMT's performing compatibility, self-awareness, interpersonal communication, and effectiveness of resource usage.

Does safety training (CRM and MRM) help? Capitelli (1988) conducted longitudinal research across three major airlines regarding the relationship between the duration of airline maintenance safety training and the maintenance related violations. He discovered that the less training received by airline maintenance technicians, the more violations filed against maintenance could occur. In the contemporary aircraft maintenance field, MRM training primarily seeks to reduce maintenance flaws and aviation accidents by heightening the level of self-awareness and interpersonal communication. In other words, MRM training has gained its deserved currency from the air industry (Lavitt, 1995).

Advisory Circular (AC) 120-51

Certainly, the FAA had contributed significant effort to the development of maintenance resource management rooted in the research playground of human factors. In order to propose a framework of MRM training for the air industry, the FAA issued Advisory Circular (AC) 120-51A in 1992 (FAA, 1992), 120-51B in 1997 (FAA, 1997), 120-51C in 1998 (FAA, 1998), and 120-51D in 2001 (FAA, 2001) to cope with human factors such as situational awareness, leadership, communication skills, teamwork, and decision making that directly affected aviators. The FAA's suggested training curriculum topics in AC 120-51D involve two major sectors: (a) communications process and decision behavior; and (b) team building and maintenance. The first sector contains suggested trainings in open communication, conflict resolution, situational awareness, evaluation, and recognition, and group decision making. The second recommended sector includes the trainings of leadership and followership, interpersonal dynamics, management climate, workload management, preparation and vigilance, distraction avoidance, and stress reduction (FAA, 2001 May). The federal regulations in light of the implementation of the newly issued AC 120-51D are listed in FAR Part 121 and Part 135 for all flight crews, dispatchers and flight attendants. As stated in FAR Part 121-419(b), initial ground training must contain the following programmed hours of safety instruction: 1) Group I airplanes - reciprocating powered (64 hours) and turbopropeller powered (80 hours), and 2) Group II airplanes (120 hours) of training for pilots and flight engineers. The regulated hours of human factors training for flight attendants are from four (4) to twenty hours while the DRM training hours for dispatchers are from 30 to 40, which depends on the category of air service (ASA, 2001a).

Joint Aviation Regulation (JAR) and Canadian Aviation Regulation (CAR)

As stated by the JAA in 2001, "the FAA has decided to focus on research, publication of guidance material and the promotion of Human Factors Programmes without changing the regulatory framework" (JAA, 2001, p.5). In other words, the FAA does not attempt to regulate MRM at the present time. In Europe, the Joint Aviation Authority (JAA) has regulated such safety training for aircraft technicians since June 1, 1998. Addressed in the JAR Part 66, an aircraft engineering candidate should be tested

regarding the knowledge of maintenance human factors and a detailed or itemized examination should be otherwise discussed. The knowledge requirement of maintenance human factors is to enhance a technician's situation awareness, mental consciousness, interpersonal communication, and ongoing self-evaluation (JAA, 2001). In Canada, the Transportation Canadian, the aviation authority in Canada, has also regulated the similar safety training in Canadian Aviation Regulation (CAR) Part V, "Airworthiness Manual Chapter 566-13," since August 1998 (Transport Canada, 2001, December 12). As outlined in this chapter, an aircraft maintenance candidate should be able to apply occupational health and safety practices and explain how human factors contribute to maintenance errors (Transport Canada, 2001, December 12). The regulatory requirement issued by the JAA and Transport Canada has forced the maintenance training schools within the European Union (EU) and Canadian territories to embed human factors training for student aircraft technicians.

The FAA's fundamental training requirement for an AMT listed in FAR Part 147.21 is 1,900 hours (400 hours general, 750 hours airframe, and 750 powerplant) (United States Government Printing Office [US GPO], 2001, November 18). Each training section is basically divided into three subsections for a total of nine (9) subsections. The aircraft knowledge and practice skills portion of technician training should contain general, airframe, and powerplant sections of training listed in FAR Part 147 Appendix B, C, and D. Table 6 illustrates a typical training curriculum for the FAA Part 147 technician school.

Table 6

The Typical Aircraft Technician Training Syllabus in the United States

General Training	Basic electricity, aircraft drawing, weight and balance, tubing and fitting, ground operation, material and process, mathematics, physics, corrosion control, form and record, maintenance publications, and mechanic privileges and limitations.
Airframe Training	Wood structure, aircraft covering and finishing, sheet metal and non-metallic structure, welding, assembly and rigging, airframe inspection, landing system, hydraulic and pneumatic system, cabin atmosphere control, aircraft instrument system, navigation and radio communication, fuel system, electrical system, position warning system, ice and rain control, and fire protection system.
Powerplant Training	Powerplant theory and maintenance, reciprocating engine, turbine engines, engine inspection, engine instrument system, engine fire protection system, engine electrical system, lubrication system, ignition and starting system, fuel metering system, engine fueling system, induction and airflow system, engine cooling system, exhaust and reverser system, propellers, unducted fans, and auxiliary power unit.

Resource: FAA FAR Part 147 Appendix B, C and D.

Without a doubt, there is no regulation of MRM training, human factors, or related safety classes in the syllabus for student AMTs during their stay in maintenance training schools.

However, in Europe, after June 1, 1998, in addition to the avionic training and understanding of legislation, the new revised training modular syllabus of the JAA's JAR Part 66, "knowledge requirements," has enforced the maintenance human factors to be tested (Federal Office for Civil Aviation [FOCA], 2001 May). Swiss FOCA reflected this policy change and categorized the training syllabus for this aircraft maintenance license (AML) into 17 training modules (see Table 7):

Table 7
JAR-66 AML Training Modules

Module 1	Mathematics	Module 10	Aviation legislation
Module 2	Physics	Module 11	Aeroplane systems (Mechanical)
Module 3	Electrical fundamentals	Module 12	Helicopter systems (Mechanical)
Module 4	Electronic fundamentals	Module 13	Aircraft systems (Avionic)
Module 5	Digital techniques	Module 14	Propulsion (Avionic)
Module 6	Material & hardware	Module 15	Turbine engine
Module 7	Maintenance practices	Module 16	Piston engine
Module 8	Basic aerodynamics	Module 17	Propellers
Module 9	Human factors	Module 18	Reserved

Resource: Swiss Federal Office for Civil Aviation [FOCA]. (2001 May), *Conversion of a Swiss Licence to a restricted or full JAR-66 aircraft maintenance licence (AML)*.

The cross-reference between JAR and FAR implies that the insertion of MRM or human factors education to the existing training program seems reasonable. However, from Maddox's angle, both current minimum duration of overall AMT training (1900 hours) and tuition would be increased. Will it erode one's willingness to become an aircraft technician? The shortage of AMTs in aviation industry has been a serious problem and the shortage keeps expanding (Phillips & Taverna, 2001). This situation is not only negatively affecting maintenance operations, but will literally slash the quality of maintenance.

The Relationship Between Regulation and Safety

Mudge (1998) argued that without a solid law regulating specific human operation in relation to the MRM in aircraft maintenance, the decision making of human beings will be by no means flawless. Especially, he argued that personal capability of making correct decision will be shrunken when one is immersed in a highly stressful environment or under heavy workload. He further argued that in aviation safety training, without regulations, human reactions to any ongoing abnormal situations in lieu of a standardized procedure will tend to revert back to the original skills because they feel more comfortable to apply. In other words, AMTs will act just as they would have prior to any safety training. It is called the law of primary in psychology (Mudge, 1998). As the FAA itself reported in AC 120-51D 7e, "when there is no effective reinforcement...by way of recurrent training, improvements in attitudes observed after initial indoctrination tend to disappear, and individuals' attitudes tend to revert to former levels" (FAA, 2001). The

safety training will be in vain provided there is no official regulation associated with it for the obligatory recurrent safety trainings.

The study of Lofaro and Smith (1998) in this area stated that the FAA's regulations are only the minimum standards for flight operation and maintenance performance. Although the airlines always commit to exceed the marginal criteria for the sake of passenger safety and company reputation, maintaining the above-standard safety performance can only happen when an air carrier's finance is healthy (Lofaro and Smith, 1998). They argued that "when any air carrier is in financial trouble" or wants to maximize its profit, "there are only a few ways open to cut costs: reduce the quality and training of both flight crew and mechanics, reduce the quality of the maintenance and outsource all you can" (Lofaro and Smith, 1998, p.213). If the airlines seek to cut training costs, they will cut the items related to maintenance people such as MRM. It is legal not to conduct MRM training for AMTs. Yet it violates the federal regulation provided the regulated CRM for the flight crews is absent. Even though the airlines are in a stable financial condition, based on the regulation, they are legally allowed not to spend resources in MRM training and still meet the FAA safety requirements.

Because the FARs do not contain an explicit regulation of human factors or related training for AMTs, many non-profit organizations, such as the Air Transport Association (ATA) and National Air Transportation Association (NATA) have called for an initial revision of AMT licensing procedures (Maddox, 2001).

Research Propositions

Executive Order 12866 and 13132 were issued to direct federal agencies to assess economic impact and cost analysis on state and local government. The Regulatory Flexibility Act of 1980 was passed to reinforce stakeholders collecting public voice before proposing a policy or regulation (Filler, 2001 July 11). However, regardless of the mandated guidelines of the Executive Order 12866, Executive Order 13132, and the Regulatory Flexibility Act of 1980, FAA's operation is also pulled by various administrative actors such as the Office of Management and Budget (OMB), segmented federal cabinets, and industry lobbyists (Filler, 2001 July 11). The administrator's role should be that of a facilitator who politically integrates "administrative conservatism" in an organization as Terry (1995, p. XX) depicted. Administrators should retain a role of conservator, who should filter and control the external influence upon organizations (Terry, 1995). In addition, the function of a public administrator should remain in "balance wheel" fashion as argued by Rohr (1986, p.182) – people who pamper legislative power, judicial surveillance and public needs (Rohr, 1986).

It is understandable that public agencies have been placed in the center of the political vortex. Hence, decision making is never simple or linear within this iron-triangle. It is a battlefield; plural-value competitions are underway. The merits of arguments should thus contain the following multi-dimensional research aspects: What's the rationale not to regulate MRM by the government? What is the nature of the FAA's policy making? What human factors affect AMT performance? What is the airlines'

attitude in conducting non-regulatory MRM training? Should we need to regulate MRM? Are there any alternatives for MRM? Do we need to revise the initial technician training syllabus? If so, can we revise the technician training syllabus without adding more training hours? If the answer is no, what is the current AMT's reaction to an obligatory MRM? Is it costly to conduct MRM training? What is the true relationship between MRM training and safety performance?

Conclusion

While the global aviation industry works closely to strike for a zero-accident operational climate by recruiting MRM or related training as an initial safety training for aircraft technicians, the FAA's reluctance in relation to the attempt of regulating MRM is a researchable case. Theoretically, on the one hand, if MRM shows no importance to aircraft technicians in the U.S., the FAA does not have to revise it for and recommend it to aviation world. On the other, without a regulatory foundation, the airlines are allowed not to implement MRM in order to reduce operational cost. The competing value between promoting safety level and reducing expenses remains sound. The rationale behind the FAA's current non-regulatory stance should be thoroughly unveiled.

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Disaster Preparedness, Emergency Response, and Curriculum Development

A White Paper

for the

Tim Forte Collegiate Aviation Safety Symposium

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Denver, CO

by

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Disaster Preparedness, Emergency Response, and Curriculum Development**Overview**

A new upper-level aviation course at the University of Nebraska at Omaha resulted from the application of research in the area of safety, disaster preparedness, and emergency response. The course, Airport Safety and Security, was conceived following the crash of TWA 800 and the subsequent White House Commission and the growing awareness of emergency planning and disaster response in aviation. The course was developed utilizing research into curriculum needs in this area, including discussions with industry and government experts. The results of this research revealed components for inclusion, such as airport and ramp safety, OSHA requirements, risk assessment and management, disaster preparedness, emergency response plans, coordination among authorities, crisis communication, and passenger rights. The research also revealed that the structure of such a course lends itself to a seminar format and required many areas of expertise. The result is a comprehensive curriculum design which provides a model for ready implementation in collegiate aviation education programs.

Introduction

Curriculum development can be achieved through the application of the research model. A new upper-level aviation course at the University of Nebraska at Omaha (UNO) followed such a plan. The course, Airport Safety and Security, was conceived following the crash of TWA 800 and the subsequent White House Commission, as well as the growing awareness of emergency planning and disaster response in aviation. The course was developed utilizing research into the curriculum needs in this area, including discussions with industry and government experts. The

results of this research revealed components for inclusion, such as airport and ramp safety, OSHA requirements, risk assessment and management, disaster preparedness, emergency response plans, coordination among authorities, crisis communication, and passenger rights. The research also revealed that the structure of such a course lends itself to a seminar format and required many areas of expertise.

The course which was developed is described in detail in this white paper. This course, Airport Safety and Security, is offered at the University of Nebraska at Omaha (UNO) as Aviation 4086/8086. The seminar format is well-suited to graduate students as well as undergraduate students.

Course Description

This course was designed to allow the students to explore the role of airports in relation to safety and security. Topics of the course include regulations, responsibilities, security issues, ramp safety, disaster preparedness, and emergency management. The course is intended for all students interested in aviation, however the prerequisites for this course specify junior standing and completion of the aviation introductory course. Due to the availability of government documents on-line, students are required to have access to and a working knowledge of the World Wide Web.

Important to a course on aviation security, it is made explicitly clear to students that *under no circumstance are students to attempt infiltration of aviation security*, as this is a violation of federal law.

Content and Organization

The introduction to this course will include the course objectives and overview, concepts, and terms. The importance of airport safety and security in the aviation industry will be discussed, as well as the uniqueness of aviation compared to other industries.

The topic of airport security will involve the study of security regulations for the U.S. and international community. Government, airports and airlines security responsibilities will be covered, along with physical security equipment requirements. Historical perspectives and the future outlook of terrorism in aviation will be studied. Recent security issues such as disruptive passengers, baggage match, passenger profiles, certification of security companies, and background checks will be explored. The section on dangerous goods will include explosives, bomb detection equipment, K-9 units, and hazardous materials. Aviation law enforcement and internal security for the airlines will be explored in terms of prevention strategies.

Airport Safety will include ramp safety, OSHA, risk assessment and management.

Disaster preparedness will accommodate aviation emergency management; emergency response plans; coordination among government, airports, airlines, and non-profit authorities; crisis communication; and passenger rights, which will entail the Red Cross and the NTSB Family Assistance Act.

Objectives

The course objectives were established for students based upon the practical applications of the course material. Upon completion of the course, the student should be able to:

- Differentiate between airport and airline responsibilities in safety and security.
- Outline and explain the appropriate regulations governing airport safety and security.

- Trace the evolution of aviation security in terms of the unique threat to aviation.
- Evaluate appropriate methods for securing airports.
- Develop a safety plan for an airline station at an airport.
- Develop an emergency response plan for an airport including federal requirements.
- Identify the essential organizations available to respond to airport emergencies.

Methodology

Students will learn course material through various means. First, the written communication component will incorporate a final essay exam and other written assignments. The oral communication component includes in-class presentations, group exercises, and class participation. The computer and technology component includes word processing, e-mail, web assignments, library database searching, and education technology presentations to the class. Since all assignments must be typed, students are encouraged to use the UNO computer labs for computer applications. The international component includes aviation security issues which affect U.S. airlines overseas. The research component consists of the course project or paper.

Additionally, various teaching methodologies will be used in administering the course. The course will be delivered through in-class lectures, guided discussions, on-line demonstrations, guest speakers, and media-oriented presentations. The instructor will stimulate thinking, provide enthusiasm, be responsive to students, be well prepared for class, and explain and clarify subject material. The instructor will grade fairly, clarify subject material, and be available to students for office hours.

Evaluation

As the class is offered to both graduates and undergraduates, differing evaluation mechanisms were established. The undergraduate final exam will consist of essay and short answer questions which will be comprehensive in nature. Undergraduate students will prepare

three article critiques over the assigned articles. Each critique will be 1½ - 2 double-spaced typed pages. The critiques will require students to analyze information in the article, not summarize it. They will be evaluated on their ability to incorporate other course materials in the analysis to strengthen the critiques. Students will present the critiques to the class and lead a discussion. The final course grade for undergraduate students will be based on the following point scale:

Undergraduate Final Exam	400
Article Critiques (3 at 100 each)	300
<u>Participation</u>	<u>100</u>
Total Points	800

The graduate final essay exam will be comprehensive in nature. It will cover all course material, including graduate reading for the course paper. Graduate students will prepare a research paper on a topic selected from the content outline in this syllabus. Students will utilize a research methodology, such as content analysis, to conduct the research study. In the instance that a student works in the field, students may instead negotiate a project related to their job and the course material to be approved by the course instructor. The final course grade for graduate students will be based on the following point scale:

Graduate Final Comprehensive Essay Exam	400
Course Paper/Project	300
<u>Participation</u>	<u>100</u>
Total Points	800

Class participation is required of all students and may consist of announced or unannounced quizzes, attendance, participation in class discussions and exercises, or any combination of these. A subjective evaluation by the instructor is the primary criterion of in-class performance.

Resource Material

Given the nature of the course material, many of the assigned readings are from government-produced documents. Readings will be assigned from the following:

- FAA Advisory Circular 150/5200-18B Airport Safety Self-Inspection
- FAA Advisory Circular 150/5200-31A Airport Emergency Plan
- National Transportation Safety Board. (1999). *Federal family assistance plan for aviation disasters*. Washington, DC: Author.
<http://www.nts.gov/publicn/2000/spc0001.htm>
- Federal Aviation Regulation Parts 107, 108, 109, 139, 191
<http://www.faa.gov/avr/AFS/FARS/far-107.txt>
<http://www.faa.gov/avr/AFS/FARS/far-108.txt>
<http://www.faa.gov/avr/AFS/FARS/far-109.txt>
<http://www.faa.gov/avr/AFS/FARS/far-139.txt>
<http://www.faa.gov/avr/AFS/FARS/far-191.txt>
- Additional articles will be available in the library on reserve.

The UNO campus offers many services for students. These organizations and offices provide students with additional resources to complete course requirements.

- **The UNO Library.** Research resources including Genisys and other services. A UNO Library guide is available specifically for locating aviation sources in the library. Website: <http://library.unomaha.edu/>
- **The UNO Computer Labs.** Computer and Data Communication Labs are located throughout the UNO campus with variable hours for student convenience. Call or visit the Help Desk at 554-DATA, located in EAB 005, for times and locations of campus computer labs.
- **The UNO Learning Center.** Provides instruction and services to assist students in the development of skills necessary for effective academic performance and positive adjustment to the college learning environment. Specifically provides tutorial services. Website: <http://www.unomaha.edu/~wwwlc/>
- **The UNO Career and Placement Office.** Information on job openings and other information for UNO students and alumni.

A current bibliography of resources for further information was established for graduate students preparing course papers and projects, as well as for undergraduate students seeking additional resources. Below is a selected website bibliography from the course handout.

Web Sites:**FAA Civil Aviation Security**

<http://cas.faa.gov>

Federal Aviation Regulation Parts 107, 108, 109, 139, 191

<http://www.faa.gov/avr/AFS/FARS/far-107.txt>

<http://www.faa.gov/avr/AFS/FARS/far-108.txt>

<http://www.faa.gov/avr/AFS/FARS/far-109.txt>

<http://www.faa.gov/avr/AFS/FARS/far-139.txt>

<http://www.faa.gov/avr/AFS/FARS/far-191.txt>

Gore Commission Final Report to President Clinton

<http://www.securitymanagement.com/goreover.html>

Journal of Air Transportation World Wide

<http://cid.unomaha.edu/~jatww>

White House Commission on Aviation Safety and Security

<http://www.dot.gov/affairs/whcoasas.htm>

Concluding Curriculum Design Components

Many suggested reading materials would supplement the student's required reading and provide graduate students with informational resources for their course paper or project. Some of the areas in which suggested readings are provided include aviation security regulations, aerial piracy, aviation hijackings, aerial sabotage, aviation terrorism, passenger profiling, bombs and bombings, air rage, sky crimes, airport safety self-inspection, airport emergency plans, occupational safety and health management, safety management, organizational learning from accidents, aviation security from an integrated system approach, crisis management, airline passenger screening, explosive detection systems, family assistance plan, international aviation security, crisis communication, baggage reconciliation, and security training.

The Collegiate Aviation Emergency Response Checklist: Fundamental Pre-crisis Planning

A paper presented

at the

Tim Forte Collegiate Aviation Safety Symposium

April 19-20, 2001

Denver, CO

by

Mary M. Fink and Michael K. Larson

University of Nebraska at Omaha

Authors

Mrs. Mary Fink is the Coordinator of research and special Programs for the Aviation Institute at the University of Nebraska at Omaha. She holds Master's and Bachelor's degrees in Aviation Administration for the University of Nebraska at Omaha. In addition to administering NASA-funded research programs in excess of \$5 million, Mrs. Fink is also an instructor for the Aviation Institute. She is a Federal Aviation Administration licensed pilot and is a member of the American Society for Public Administration; Women in Aviation, International; the Omaha-area 99s; Alpha Eta Rho, International Aviation Fraternity; and Omicron Delta Kappa Leadership Society. Her research interests lie in the areas of transportation policy and intermodal systems.

Dr. Michael K. Larson is a professional aerospace educator and pilot with over 30 years experience and 14,000 hours of pilot time, including service with Pan American World Airways. He holds a Master of Science Degree and Doctorate in Aerospace Education from Oklahoma State University. Dr. Larson was an FAA Aviation Safety Counselor and Designated Examiner with privileges in both Alaska and Oklahoma. FAA Licenses and Ratings include Airline Transport Pilot Airplane Single and Multi-engine Land and Airplane Single Engine Sea Certified Flight Instructor. (Gold Seal/ASEL/ASES/AMEL/Instrument), Flight Engineer (Turbojet Powered), and FAA Safety Counselor. His research interests include GPS systems within the National Airspace System framework, safety research on in-flight severe weather encounters, and policy research to update federal air regulations for modern pc-based simulation in pilot training as well as technological innovation in the National Airspace System.

Abstract

The University of Nebraska at Omaha Aviation Institute's commitment to the provision of a safe learning environment both in the classroom and in the air has led to the creation and adoption of an Emergency Response Checklist to be utilized in the event that a flight student is involved in an aircraft accident or incident. The plan came to fruition as the result of best practices research which examined crisis management plans at several regional flight training providers. Four Midwestern universities with aviation programs and one Air Force flying club were polled regarding current crisis procedures. At the time of the initial study, only one of the flight training providers possessed a crisis response plan. This plan outlines the roles of the flight vendor, as well as those of University of Nebraska at Omaha Campus Security, Student Affairs, University Relations, and the Aviation Institute. The goal of this plan is to eliminate uncertainty and assure that emergencies are responded to in an efficient manner with a clear and open flow of communication among all designated channels. As a result of this study, the Aviation Institute has implemented its own Emergency Response Checklist with all applicable university channels and contracted flight vendors. The outline of the checklist will be provided for review, comment and potential adoption by collegiate aviation flight training programs.

Introduction

Preparedness is crucial for proper response to crises. "An organization in crisis must be visible, show concern, and compassion, and demonstrate efforts to correct the problem to ensure similar tragedies do not occur" (Ray, 1999, p. 95). This advice, provided in Strategic Communication in Crisis Management: Lessons Learned from the Airline Industry, is applicable not solely to the airlines, but to all facets of aviation, including the flight student training environment. A plan must be instated to combat crises should the situation arise that a student is involved in an accident or incident. Crises are characterized by "surprise, threat, insufficient information, time pressures, a lack of control, stress and anxiety, and relational changes and tensions among participants" (p. 96). Implementation of a crisis management plan allows the focus to be placed on the situation at hand.

According to Rebecca Lutte, Aviation Safety and Human Factors Instructor at the University of Nebraska at Omaha Aviation Institute (UNOAI), "It's a question of when, which type, and how a crisis will occur. You can't wait" (personal communication, July 27, 1999). In the event of an emergency situation, abstruseness must be avoided. Ray states, "As the level of uncertainty decreases, decision makers are in a stronger position to identify fitting responses" (1999, p. 97). By raising the level of control an organization has over the situation, internal and external conflicts are minimized.

The University of Nebraska at Omaha Aviation Institute's Emergency Response Checklist involves the interaction and cooperation of various companies and departments. According to Ray:

Various parties who are basically unfamiliar with one another must learn to adapt and relate. Different goals, perspectives, interests, and responses make this a challenge and it

is most likely easier said than done. When groups involved act independently and fail to integrate their action plans, conflict is likely to occur. (1999, p. 100)

Therefore, all parties involved in gathering information and notification procedures are provided a detailed document outlining the exact responsibilities and expectations of each company or department.

The UNO Aviation Institute's Student Handbook declares that one of the elements of the UNOAI is to provide "a comprehensive flight training program" (p. 3). By creating the Emergency Response Checklist, the University of Nebraska at Omaha Aviation Institute demonstrates its desire to have a positive organizational culture. According to Ray, "There is a reciprocal relationship between organizational culture and communication. An organization's culture is created through communication. Communication, in turn, is influenced by an organization's culture" (1999, p. 39). The UNOAI has carefully selected its flight vendors and requires that all share UNOAI's commitment to safety.

Gary Brown, Director of Disaster Services for Woodbury County, Iowa, including Sioux City Gateway Airport, emphasized the need for a crisis plan. Brown advises that, in the event of any emergency, one should: "Think about every decision you're making . . . Keep track of all times and have a scribe" report all events (personal communication, July 29, 1999). Brown also emphasized the benefits of management research: "We learned from a lot of other people's disasters." A crisis plan is "not only a tool which enables the organization to manage the crisis, but . . . it further communicates a general mood and set of actions by management" (Ray, 1999, p. 44).

According to Chris White, Vice President of Safety and Regulatory Compliance for Midwest Express and Skyway Airlines, following an accident or incident it is crucial "to provide an environment where survivors, survivors' families, and victims' families have the best opportunity to begin the healing process" (personal communication, July 29, 1999). The same goals and commitment may be mirrored at the university level or in the flight training environment.

Method

The authors conducted best practices research to examine crisis management plans at several regional flight training providers. Four Midwestern universities with aviation programs and one local flight club were contacted by either phone, e-mail or both methods by the author. Oklahoma State University, Stillwater; Southeast Oklahoma, Durant; Central Missouri State University, Warrensburg; and the Offutt Aero Club, Bellevue stated that currently no written emergency plan is on record.

The University of North Dakota, School of Aerospace was the only program to have a detailed crisis management plan available. Deemed a "pre-accident plan," the handbook stresses commitment to safety: "It is the first duty of administration, management, faculty, supervisors, instructors, maintenance, line personnel, and all others to provide for safety in operations under their control!" (1998, cover).

Realizing the need for contingency and pre-crisis planning and the lack of such plans currently available, the University of Nebraska at Omaha Aviation Institute developed a plan based upon feedback and recommendations from members of the industry and those involved in

aircraft accident investigation. This scheme is intended to prepare all parties involved if a University of Nebraska at Omaha Aviation Institute flight student is involved in an accident or incident.

Resulting Plan

The University of Nebraska at Omaha Aviation Institute Flight Training Emergency Response Checklist: Fundamental Pre-Crisis Planning is a plan intended for implementation at all three designated UNOAI flight vendors: Hangar One, Inc., Millard Airport; the Offutt Aero Club, Offutt Air Force Base; and TAC Air, Omaha Eppley Airfield. The UNO Aviation Institute will also involve the following departments at the University: Campus Security, University Relations, Student Services, the Department of Public Administration, and the College of Public Affairs and Community Service.

According to Larry Craig, Federal Aviation Administration (FAA) Flight Standards District Office Safety Program Manager, it is essential that all flight students file a flight plan. Information therein will reveal the color and tail number of the downed aircraft as well as the name and telephone number of the aircraft home base.

As soon as there is the first indication of an aircraft accident or incident, the Federal Aviation Administration must be contacted. A call to Flight Service will result in the direct notification of the on-call Federal Aviation Administration official. According to a telephone conversation with Mr. Craig (1999, July 14), "Once we (the investigators) are on-site, you (UNOAI and its affiliates) are out of the picture. It is no longer your aircraft. As details unfold, we will notify next of kin." Craig added that flight vendors and/or the university may provide assistance in locating contact information for a victim's next of kin.

Emergency management, fire departments, and law enforcement officers are advised to follow a plan of action developed by the Flight Standards District Office. These agencies are advised to "not disturb or move the wreckage except to the [extent] necessary: to remove persons injured or trapped; to protect the wreckage from further damage; or to protect the public from injury" (Nebraska FSDO, 1999, p. 1).

Photographs of the scene must be taken, a wreckage diagram must be constructed, and the wreckage site must be preserved and secured until the aircraft is released to the National Transportation Safety Board/Federal Aviation Administration. UNOAI flight vendors may assist local authorities in this process. Additionally, the FSDO report advises on commenting to the media: "Treat the press as you would at any accident site. Advise them that federal investigators are on the way and further information may be obtained from them" (p. 2).

Together, the flight vendor must work with all authorities and related parties to ensure that the response and subsequent investigation is handled properly. The following checklist includes FAA/NTSB procedures which are utilized at the University of North Dakota (1998, p. 9) and may be emulated, in part, within the UNOAI Emergency Response Checklist:

1. Site description
2. Photographs
3. (Individual) flight records reviewed
4. Aircraft maintenance records
5. Accident/Incident/Occurrence checklist complete

6. Individual drug test results
7. Interview eyewitness(es)
8. Interview person(s) involved in mishap
9. NTSB/FAA reports submitted
10. In-house Report completed
11. Insurance Report submitted

Meanwhile, the local flight vendor will contact the FAA, UNO Aviation Institute, and UNO Campus Security. Mr. Kosel or Mr. Morton will be notified immediately. Either Mr. Kosel or Mr. Morton will then contact University Relations and Student Services, as required by Section 2.2. of the UNO Handbook. Campus Security will obtain as much information as possible from the flight vendor, local agency, or accident investigator and construct a detailed log of all communication and times when the communication took place. Campus Security will verify with the flight vendor that all local and federal authorities, including Flight Service and the Federal Aviation Administration Regional Operations Center, (816)426-4600, have been contacted. Additionally, Campus Security will refrain from making public comment to the media, forwarding all requests to University Relations.

The UNOAI will adhere to the "Protocol Concerning the Off-Campus Death of a Student" provided by Dr. Mary Mudd, Vice Chancellor of Student Affairs (1999, June 9). In the event of a fatality of a currently-enrolled aviation student, the following guidelines will be followed.

1. Notice that the Student has died is reported by Campus Security (Mr. Kosel or Mr. Morton) to the Office of the Vice Chancellor for Student Affairs.
2. The Vice Chancellor's staff will confirm the death. Dr. Rita Henry will confirm with University Relations.
3. Instructors will be contacted and asked if they would like someone from Counseling Services to speak at, or attend the first class after the student's death.
4. Student Affairs staff will notify the Registrar's Office so that a notation may be made in the student's file.
5. A letter signed by the Vice Chancellor of Student Affairs will be sent to the family on behalf of the University.
6. University Relations will be notified so that campus flags may be lowered on the day of the student's funeral.

University Relations will be responsible for responding to requests for information by the media. All communications must be coordinated with the FAA prior to delivering any and all comments. According to Ray:

While a crisis plan eliminates some of the confusion and controls many of the difficulties associated with crisis, it rarely prepares the organization for the constant media assault, the emotional impact of the event, and damaging information and headlines which threaten the organization's survival. (1999, p. 103)

Therefore, University Relations will immediately contact the Aviation Institute Director and Flight Training Coordinator to notify of the situation at hand. Aviation Institute personnel will subsequently notify the Department of Public Administration Chair and the Dean of the College of Public Affairs and Community Service.

The lead spokesperson, Assistant Director for Communications and Media, Theresa Gleason, will obtain as much information as possible from Campus Security, while maintaining a detailed log of all communication and times when the communication took place. Additionally, University Relations (Ms. Gleason) should verify that all local and federal authorities, including Flight Service and the Federal Aviation Administration Regional Operations Center have been contacted. Essentially, University Relations will act as the UNOAI's voice during an accident or incident, providing comments, interviews, updates, and referrals to federal investigators to the media

Discussion

The University of Nebraska at Omaha Aviation Institute has developed a program of preparedness in the event that a flight student is involved in an accident or serious incident. Although UNOAI has been fortunate to not have experienced an accident or serious incident to date, the adoption of a proactive, positive, pre-accident plan is necessary in the event that disaster strikes. Other universities and flight training centers will have the ability to benefit from the premise of the checklist. This plan (provided in the accompanying appendix) will be continuously evaluated and updated in order to ensure that every step is taken to provide an all-inclusive, consistent plan of action.

References

Lincoln, Nebraska Flight Standards District Office (FSDO). (1999). EMS, Fire department, law enforcement: Aircraft accident procedures. (Available from the Lincoln, Nebraska FSDO, (402) 475-1738).

Ray, S. (1999). Strategic communication in crisis management: Lessons learned from the airline industry. Portland, OR: Book News.

University of Nebraska at Omaha Aviation Institute. (1999, May 24). Undergraduate student handbook. Omaha, NE: University of Nebraska at Omaha.

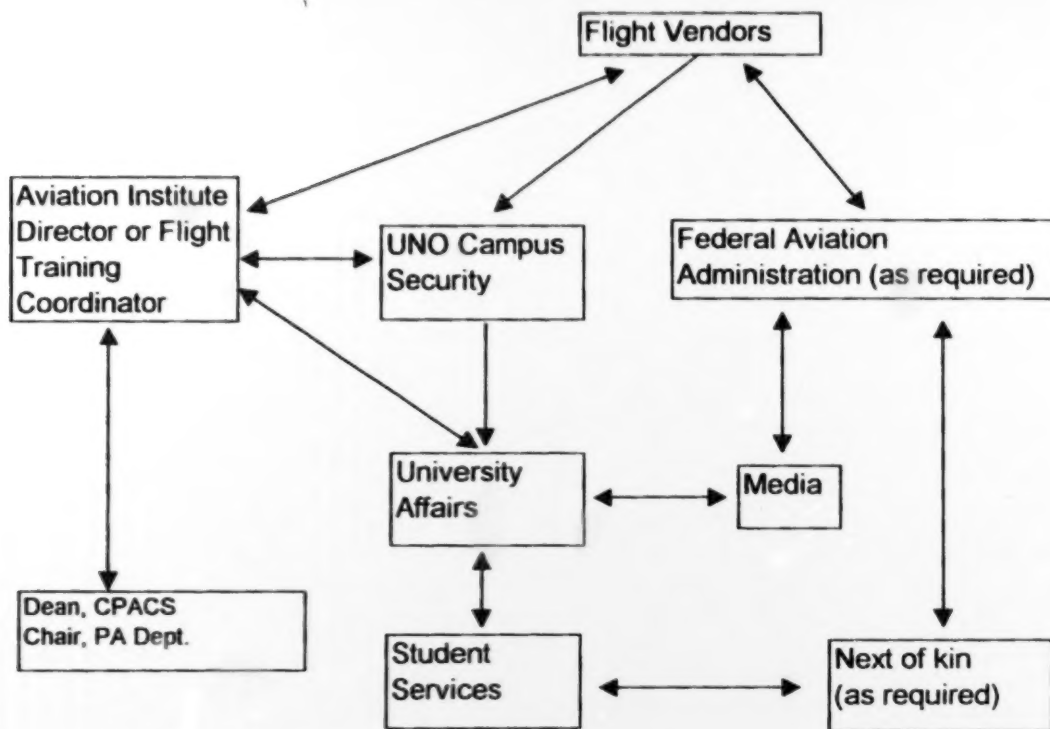
University of North Dakota. (1998, October). UND Aerospace pre-accident plan (4th ed.). Grand Forks, ND: UND Aerospace Foundation.

Acknowledgment

The University of Nebraska at Omaha Aviation Institute Flight Training Emergency Response Checklist: Fundamental Pre-Crisis Planning is the product of the UNOAI's pro-active commitment to aviation safety and security. The author would like to thank Mr. Dana Siewert of the University of North Dakota and Mr. Larry Craig of the Flight Standards District Office located in Lincoln, Nebraska, for their assistance in providing their best practices in aviation crisis management.



University of Nebraska at Omaha Flight Accident/Incident Notification Checklist





*University of Nebraska at Omaha
Aviation Institute*



The University of Nebraska at Omaha Aviation Institute, Flight Training Division

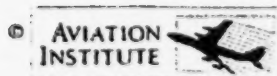
✓ Emergency

✓ Response

✓ Checklist

Adopted December 1999

Revised February 2001



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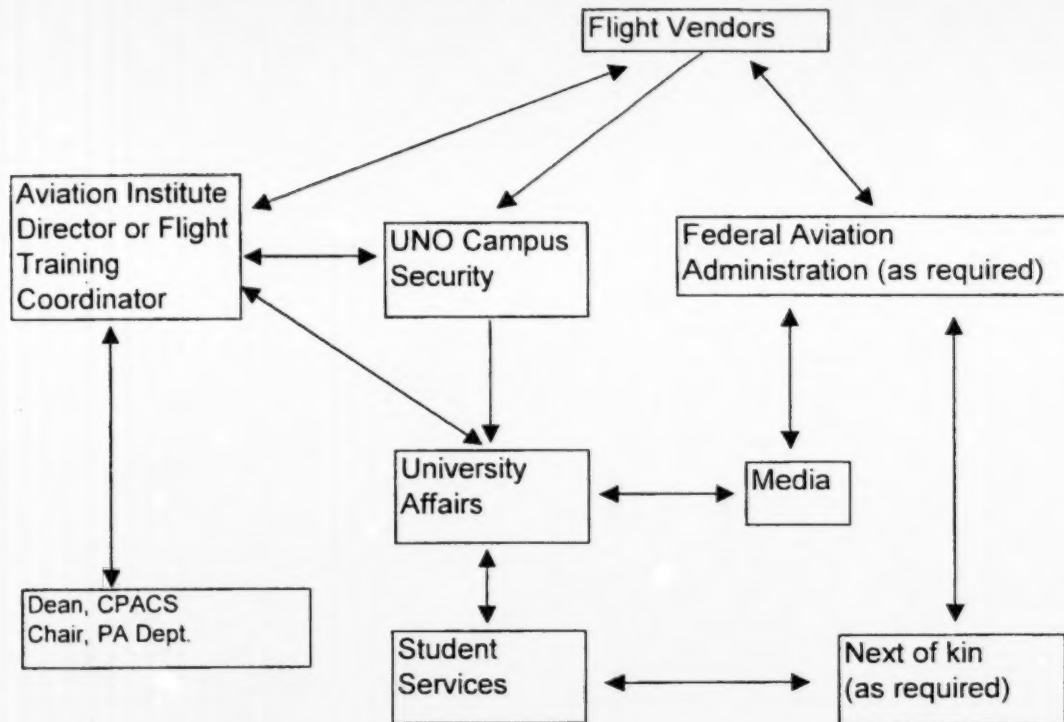
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Foreword

The University of Nebraska at Omaha Aviation Institute is committed to providing its students a quality education. A key element of the University's program is the provision of a safe learning environment both in the classroom and in the air. Therefore, the University is adopting an Emergency Notification/ Response Checklist for use in the event that a University flight student is involved in an aircraft accident or incident. This plan outlines the roles of the flight vendor, as well as University of Nebraska at Omaha Campus Security, Student Affairs, University Relations, and the Aviation Institute. The goal of this plan is to eliminate uncertainty and assure that emergencies are responded to in an efficient manner with a clear and open flow of communication among all designated parties.



University of Nebraska at Omaha Flight Accident/Incident Notification Checklist



The University of Nebraska at Omaha Aviation Institute, Flight Training

Notification/Emergency Response Plan

This plan is intended to be implemented at the four designated University of Nebraska at Omaha Aviation Institute (UNOAI) flight vendors: Advanced Air, Inc., Council Bluffs Airport; Hangar One, Inc., Millard Airport; the Offutt Aero Club, Offutt Air Force Base; and TAC Air, Omaha Eppley Airfield. This plan also involves the following departments at the University: Campus Security, University Affairs, Student Services, the College of Public Affairs and Community Service, the Department of Public Administration, and the Aviation Institute.

All Aviation Institute flight students are expected to file and activate FAA flight plans for all cross country flights. All flights will be monitored by the student's flight instructor or a designated official of the Flight School.

The Federal Aviation Administration is to be contacted by the appropriate authorities in the event of an aircraft accident or incident. In the event of injury or fatality to a UNO student, Federal Aviation Administration officials will notify next of kin. The affected Flight Vendor and/or the University will provide assistance in locating contact information for next of kin.

The initial major concern of the University will be the media requests for information and comments. One of the purposes of this plan is to specify the University Affairs Office as the University's sole point of contact for media inquiries. Refer all media information requests to the Lincoln Flight Standards District office and/or

University Affairs Office. If asked by the media or anyone not specified in this Emergency Response Checklist to provide additional information or personal opinions, advise them that "the incident is being investigated by the Federal Aviation Administration and further information may be obtained from them." The UNO student contracts directly with the flight vendor for his/her flight training, and, therefore, the flight vendor must work directly with all authorities and related parties to ensure that the response and subsequent FAA investigation is handled properly.

Specifically, in the event an UNOAI flight student is involved in an accident or incident, the local flight vendor will contact: (1) Federal Aviation Administration (2) UNOAI representative and (3) UNO Campus Security. Campus Security will in turn contact Mr. Kosel or Mr. Morton as soon as possible. Either Mr. Kosel or Mr. Morton will then contact University Relations and Student Services, as required by Section 2.2. of the UNO Handbook. Campus Security will obtain as much information as possible from the flight vendor, local agency, or accident investigator and construct a detailed log of all communication and times when the communication took place. A UNO Aviation Institute representative and Campus Security will monitor and verify the steps outlined in this Emergency Response Checklist are being accomplished in a timely fashion. Campus Security and the UNOAI representative will refrain from making public comment to the media or anyone else not specified in this Emergency Response Checklist, forwarding all requests to the Federal Aviation Administration and/or University Affairs Office.

The UNOAI will adhere to the "Protocol Concerning the Off-Campus Injury/Death of a Student" provided by Dr. Mary Mudd, Vice Chancellor of Student Affairs (1999,

June 9). In the event that a currently-enrolled aviation student has died, the following guidelines will be followed.

1. Notice that the Student has died is reported by Campus Security (Mr. Kosel or Mr. Morton) to the Office of the Vice Chancellor for Student Affairs.
2. The Student Affairs Vice Chancellor's staff will confirm the death with University Affairs.
3. Instructors will be contacted and asked if they would like someone from Counseling Services to speak at, or attend the first class after the student's death.
4. Student Affairs staff will notify the Registrar's Office so that a notation may be made in the student's file.
5. A letter signed by the Vice Chancellor of Student Affairs will be sent to the family on behalf of the University.
6. University Affairs will be notified so that campus flags may be lowered on the day of the student's funeral.

University Affairs will be responsible for responding to requests for information by the media. All communications must be coordinated with the FAA prior to delivering any and all comments.

While a crisis plan eliminates some of the confusion and controls many of the difficulties associated with crisis, it rarely prepares the organization for the constant media assault, the emotional impact of the event, and damaging information and headlines which threaten the organization's survival.

University Affairs will establish and maintain communications with the Aviation Institute Director and/or Flight Training Coordinator to provide a unified and collaborative effort.

Essentially, University Affairs will act as the UNO and Aviation Institute voice during an accident or incident, providing comments, interviews, updates, and FAA/NTSB referrals to the media.

UNOAI personnel will update the Department of Public Administration Chair and the Dean of the College of Public Affairs and Community Service.

Appendix A: Contact Names and Information (last updated 12 April, 2001)

Note: These numbers are to be considered confidential information of the UNO Aviation Institute, and are not to be used, disclosed, or reproduced, in whole or in part, without the express consent of the University of Nebraska at Omaha Aviation Institute.

UNOAI Flight Training Vendors

Mr. Jack Jackson; Hangar One, Millard Airport

12916 Millard Airport Plaza; Omaha, NE 68137.

Mr. Web Bell; Offutt Aero Club, Offutt AFB

P.O. Box 13234; Offutt AFB, NE 68113-0234.

Mr. Roy Timm; TAC Air, Omaha Eppley Airfield

3737 Orville Plaza; Omaha, NE 68110.

Mr. Dan Smith; Advanced Air, Inc., Council Bluffs Airport .
.....

UNO Campus Contacts

Campus Security

Mr. Paul Kosel, home

-OR-

Mr. Chester Morton, home

University Relations

Ms. Theresa Gleason, Asst. Dir., Comm. & Media

Student Services

Dr. Mary Mudd, Vice Chancellor, home

UNO Aviation Institute, Departmental Contacts

Dr. Michael K. Larson
 Pager.
 Cell.
 Home.
 E-mail.

Dr. Brent Bowen, Director
 Cell (use both page & voice mail features)
 Home.
 E-mail.

Mr. Denny Acheson, Senior Comm. Service Assoc.
 Home.

Department of Public Administration.

Dr Russell L. Smith, Chair, home.

College of Public Affairs and Community Service.

Dr. B.J. Reed , Dean, home

Local/Federal Authorities

Flight Service Station, Columbus, NE. (800) 992-7433
FAA Central Region Operations Center, Kansas City, MO. . . . (816) 426-4600
Local Authorities/Rescue. 911

Dear Flight Vendor:

The University of Nebraska at Omaha Aviation Institute (UNOAI) is dedicated to providing a safe flight environment for its students. As a designated flight vendor for the UNOAI, your company has been selected to train our students to become safe, responsible aviators.

The UNOAI has recently adopted an Emergency Response Checklist (ERC) which we ask you use in the event that one of our students is involved in an aircraft accident or incident. As a UNO designated flight vendor, your primary responsibilities include the following:

- Monitor all UNO student flight training. Efforts to locate a student will be initiated when a solo/dual flight is overdue by over 30 minutes.
- Require students to file a flight plan with FAA Flight Service for all cross country flights.
- Maintain a current student file which includes contact information for next of kin.
- Contact the appropriate local and federal authorities, including Flight Service [(800) 992-7433] and the Federal Aviation Administration Regional Operations Center [(816) 426-4600], in the event of an accident or incident.
- Contact a UNO Aviation Institute representative and Campus Security (24-hour availability) at the University of Nebraska at Omaha (see list).
 - 1) Inform UNOAI and Campus Security that an UNO Aviation Institute student has been involved in an accident/incident.
 - 2) Indicate whether the Federal Aviation Administration authorities have been notified or not.
- Obtain as much information as possible regarding the accident/incident, including weather conditions at the site and time, aircraft maintenance log, and arrange for drug/alcohol testing, if required.
- ***Refrain from making public comment to the media or anyone else not specified on this Emergency Response Checklist***, including all employees. Forward all questions to the appropriate federal authorities.
- Train all staff regarding the procedures of the ERC, maintain a current copy of the ERC where it can be readily found, and provide all staff with updates to the ERC when issued by UNOAI.

in this matter. Please contact me at 554-3424 should you have any questions regarding our Emergency Response Checklist.

Sincerely,

Michael K. Larson

Enc.

February, 2001

Dear Mr. Kosel and Mr. Morton:

The University of Nebraska at Omaha Aviation Institute (UNOAI) is dedicated to providing a safe flight environment for its students. Campus Security plays an important role in this mission.

The UNOAI has recently adopted an Emergency Response Checklist (ERC) which we ask you use in the event that one of our students is involved in an aircraft accident or incident. Upon notification (from any source) that an UNO Aviation student is involved:

- Contact University Affairs, 554-2358, and Student Services, 554-2779, as required by Section 2.2 of the UNO Handbook.
- Obtain as much information as possible from the flight vendor, local agency, or accident investigator who has notified you.
- Maintain a detailed log of all communication and times when the communication took place.
- ***Refrain from making public comment to the media, or anyone else not specified on this Emergency Response Checklist***, including all employees. Forward all questions to University Affairs, 554-2358, or to federal authorities.

The University of Nebraska at Omaha Aviation Institute thanks you for your cooperation in this matter. Please contact me at 554-3424 should you have any questions regarding our Emergency Response Checklist. You will be provided periodic updates, should the above stated information be amended.

Sincerely,

Michael K. Larson

Enc.

Dear Dr. Mudd:

The University of Nebraska at Omaha Aviation Institute (UNOAI) is dedicated to providing a safe flight environment for its students. UNO Student Services plays an important role in this mission.

The UNOAI has recently adopted an Emergency Response Checklist which is to be strictly adhered to in the event that one of our flight students is involved in an accident or incident. Should an emergency arise, you will be notified immediately by UNO Campus Security. UNO Student Services will be called upon to fulfill the following roles, as outlined in UNO's "Protocol Concerning the Off-Campus Death of a Student":

- Confirmation of fatalities/injuries. Confirm with University Affairs that student is from UNO and is a flight student.
- Contact university instructors, asking if they would like someone from Counseling Services to speak at, or attend the first class following the student's death/serious injury.
- In the event of a student death, notify the Office of the Registrar, so that a notation may be made in the student's file.
- Mailing of a letter to the next of kin, signed by the Vice Chancellor of Student Affairs, on behalf of the University.
- Notification to University Affairs so that campus flags may be lowered on the day of the student's funeral.
- Additionally, in the event that a student is severely injured, appropriate communications with University Affairs and the authorities should take place.

The University of Nebraska at Omaha Aviation Institute thanks you for your cooperation in this matter. Please contact me at 554-3424 should you have any questions regarding our Emergency Response Checklist. You will be provided periodic updates, should the above stated information be amended.

Sincerely,

Michael K. Larson

Enc.

February, 2001

Dear Ms. Gleason:

The University of Nebraska at Omaha Aviation Institute (UNOAI) is dedicated to providing a safe flight environment for its students. UNO University Affairs plays an important role in this mission.

The UNOAI has recently adopted an Emergency Response Checklist (ERC) which we ask you to follow in the event that one of our flight students is involved in an accident or incident. In this event, you will be notified by Campus Security. UNO University Affairs' primary responsibilities will include the following:

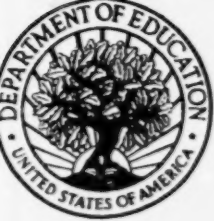
- ➔ Immediately contact and maintain communications with the Aviation Institute Director and/or Flight Training Coordinator to coordinate efforts.
- ➔ Obtain as much information as possible from Campus Security.
- ➔ Maintain a detailed log of all communication and times when each communication took place.
- ➔ Verify that all federal authorities, including Flight Service [(800) 992-7433] and the Federal Aviation Administration Regional Operations Center [(816) 426-4600] have been contacted.
- ➔ Verify that the student is from UNO and is enrolled in flight training. Obtain these facts from Dr. Brent Bowen or Mike Larson [554-3424] at the Aviation Institute or through Dr. Mudd's office, UNO Student Services [554-2779].
- ➔ Provide comments, interviews and updates to the media. Please note that you may refer the media to federal investigators for information regarding the accident/incident.
- ➔ In the event of a student's death, communicate with UNO Student Services to ensure that campus flags are lowered on the day of the student's funeral.

The University of Nebraska at Omaha Aviation Institute thanks you for your cooperation in this matter. Please contact me at 554-3424 should you have any questions regarding our Emergency Response Checklist. You will be provided periodic updates, should the above stated information be amended.

Sincerely,

Michael K. Larson

Enc.



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